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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/782,274	02/19/2004	Michael K. Lindsey	MKL-003	4235

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EXAMINER	
RADA, ALEX P	

ART UNIT	PAPER NUMBER
3714	

MAIL DATE	DELIVERY MODE
05/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Interview Summary	Application No.	Applicant(s)	
	10/782,274	LINDSEY ET AL.	
	Examiner	Art Unit	
	Alex P. Rada	3714	

All participants (applicant, applicant's representative, PTO personnel):

(1) *Alex P. Rada*. (3) *Corbett Coburn*.

(2) *Michael Lindsey*. (4)_____.

Date of Interview: *09 May 2007*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☐ No.
If Yes, brief description: _____.

Claim(s) discussed: *22*.

Identification of prior art discussed: *Larson*.

Agreement with respect to the claims f)☐ was reached. g)☐ was not reached. h)☒ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *See Continuation Sheet*.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required

Continuation of Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Applicant further elaborated on the claimed invention. Applicant faxed proposed argument regarding the "Chip-On-Board" or COB article citing the differences between a regular IC chip on a circuit board versus a COB. Parties agreed to language regarding the particulars of the timer in the claimed invention. The examiner noted that any proposed amendments to the claims would have to be formally filed and then further searching and consideration would have to be done .

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To:	**Examiner Rada**	Fax:	**571-273-4452**
From:	**Michael Lindsey**	Date:	**4/30/2007**
Re:	**Appl No. 10/782,274 "Electronic Die"**	Pages:	**5 pages including this cover sheet**

Cc:

☐ Urgent x For review ☐ Please comment ☐ Please reply ☐ Please recycle

DRAFT DRAFT DRAFT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Michael K. Lindsey et al.	
	Art Unit: 3712
Appl. No. 10/782,274	Examiner: Alex Rada
Filed: February 19, 2004	Atty. Docket: MKL-003
For: Electronic Die	

Discussion Points for Proposed Examiner Interview

In response to the Advisory Action, this interview is being requested because it appears that the claim term "(COB) mounted" (in claims 22 and 33), is not being given its ordinary meaning as understood by those skilled in the art. "COB" is a term of art. COB mounting is when one or more bare IC chips are mounted directly on a PCB, which eliminates conventional IC packages and dramatically reduces PCB size. This is the commonly understood meaning of the term "COB", as demonstrated by the attached Exhibit 1. The claimed COB-mounted IC is a significant advantage of Applicants' electronic die because it allows further miniaturization. No further claim language is necessary to convey the above meaning and advantage of the COB-mounted IC. Although COB mounting may not change the function of the circuit, it is an entirely different circuit assembly structure than what is taught by the cited references. It is a substantial advance for electronic dice because it allows the circuit board to be much smaller, and thus, the dice themselves to be smaller. This structural change is significant for determining patentability. None of the cited references teaches or suggests an electronic die including a COB-mounted IC. For at least this reason, claims 22 and 33, as well as claims 23 – 32 and 34 - 41 by their respective dependency, are patentable over the cited references.

Please call me at the number below to schedule a telephone interview at a time convenient for you.

DRAFT DRAFT DRAFT

Respectfully submitted,

April 30, 2007

Michael K. Lindsey
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Chip-on-Board (COB)

Assembly Links:

Die Attach
Wirebonding
Molding

See Also:

TAB Assembly
Flip Chip
IC Manufacturing
Assembly Equipment

Chip-on-Board, or **COB,** refers to the semiconductor assembly technology wherein the microchip or die is directly mounted on and electrically interconnected to its final circuit board, instead of undergoing traditional assembly or packaging as an individual IC. The elimination of conventional device packaging from COB assemblies simplifies the overall process of designing and manufacturing the final product, as well as improves its performance as a result of the shorter interconnection paths.

The general term for COB technology is actually 'direct chip attachment', or DCA. Aside from circuit boards used for COB's, various substrates are available for use in DCA. There are, for instance, ceramic and glass ceramic substrates which exhibit excellent dielectric and thermal properties. Organic substrates that weigh and cost less while providing a low dielectric constant also exist. There are also flex substrates which, being pliable, have the ability to bend. DCA assemblies have received a number of other names aside from 'COB' based on these available substrates, e.g., chip-on-glass (COG), chip-on-flex (COF), etc.

The COB process consists of just three major steps: 1) die attach or die mount; 2) wirebonding; and 3) encapsulation of the die and wires. A variant of COB assembly, the flip-chip on board (FCOB), does not require wirebonding since it employs a chip whose bond pads are bumped, which are the ones that connect directly to designated pads on the board. As such, FCOB's have their chips facing downward on the board (hence the name 'flipchip'). Aside from encapsulation, it is also necessary to 'underfill' a flip chip to protect its active surface and bumps from thermo-mechanical and chemical damage.

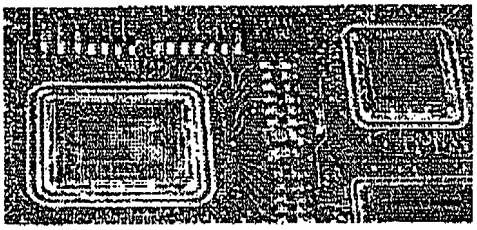

Figure 1. Example of a Chip-on-Board (COB) Assembly; note that the chips are directly wirebonded to the PCB

Die attach basically consists of applying a die attach adhesive to the board or substrate and mounting the chip or die over this die attach material. Adhesive application may be in the form of dispensing, stencil printing, or pin transfer. Die placement must be accurate enough to ensure proper orientation and good planarity of the die. This is followed by a curing process (such as exposure to heat or ultraviolet light) that allows the adhesive to attain its final mechanical, thermal, and electrical properties. After curing, organic contaminants must be removed either by plasma or solvent cleaning so as not to affect the wirebonding process.

The wirebonding process is similar to that used in traditional semiconductor assembly, i.e., thermosonic Au or Cu ball bonding or ultrasonic Al wedge bonding may be employed to connect wires between the die and the board or substrate. Chip-to-chip wirebonding may also be done for COB assembly. Needless to say, the bond pads of the die and the board or substrate must be free of any contaminants and defects to ensure the formation of good and reliable bonds.

Finally, the die and bond wires are encapsulated to protect them from mechanical and chemical damage. Encapsulation is generally done by dispensing a liquid encapsulant material (usually epoxy-based) over the die and wires or by transfer molding. Encapsulants also need to undergo curing, the process of which depends on the type of encapsulant used.

Advantages offered by COB technology include: 1) reduced space requirements; 2) reduced cost; 3) better performance due to decreased interconnection lengths and resistances; 4) higher reliability due to better heat distribution and a lower number of solder joints; 5) shorter time-to-market; and 6) better protection against reverse-engineering.

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